CLAIMS

72. A process for treating wood having wood cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution consisting essentially of a non-water-based hydrophilic organic solvent and a solute having a functional group comprising an atom selected from the group consisting of trivalent, tetravalent and pentavalent atoms, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring,

applying said solution to the wood cellulose,

covalently reacting said functional groups upon said applying to said wood.

73. The process according to claim 76 wherein the solutes are monomers and further comprising the steps of simultaneous reaction and diffusion of the monomers in the wood.

74. The invention of claim 72 wherein said reacting is exothermic.

75. The process according to claim 72 wherein the reaction is self-initiating.

76. The process of claim 72 wherein the solute is comprised of monomers prior to application of the solute to said wood.

77. The process of claim 72 wherein the process further comprises the step of adding a catalyst to the solution.

78. The process of claim 77 wherein the step of adding a catalyst further comprises the set of catalytically bonding the functional group tetravalent atom across an oxygen of the cellulose hydroxyl group.

80. The process of claim 78 wherein the catalyst is added to the solution prior to application of the solution to the wood cellulose.

81. The process of claim 78 wherein the catalyst is an acid or a base.

82. The process of claim 81 wherein the acid is produced by a molecule producing an acid in the presence of water in wood.

83. The process of claim 82 wherein the acid is in the range of 0.1-10% of the solution.

84. The process of claim 83 wherein the acid is in the range from 0.1 to 4.9% of the solution.

85. The process of claim 81 wherein the acid is selected from the group consisting of acids from alkyl-halide monomers with trivalent, tetravalent and pentavalent atoms.

86. The process of claim 82 wherein the molecule is a molecule comprised of silicon and a halogen.

87. The process of claim 82 wherein the functional groups comprises a molecule producing an acid in the presence of water in wood cellulose and a molecule which does not produce an acid in the presence of water in wood cellulose that reacts exothermically on application to wood at standard atmospheric temperature and pressure.

88. The process of claim 82 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically with wood in the presence of a molecule producing an acid in the presence of water in wood cellulose.

89. The process of claim 82 wherein the non-catalytic reagents would include alkyl and hydroxyl or alkoxy bonded trivalent, pentavalent and tetravalent atoms.

90. The process of claim 85 wherein the catalyst is from the group consisting of hydrochloric, meta-phosphoric acid, poly-phosphoric acid, bases from metal alkoxides and Phosphoric acid, and combinations thereof.

91. The process of claim 85 wherein the acid is in the range of 0.01-10% *in situ*.

92. The process of claim 72 wherein the process further comprises avoiding the formation of oligomers of the functional groups prior to applying said solution to said wood.

93. The process of claim 72 further comprising the step of:

adding at least one non-reactive additive to the wood cellulose that enhances a desired property selected from the group consisting of:

fire resistance,

insect resistance,

moisture resistance

color,

adhesion, and

insulation, and

combinations thereof.

94. The process of claim 93 wherein the step of adding at least one non reactive additive

further comprises adding the additive to the solution.

95. The process of claim 93 wherein the step of adding the at least one non-reactive additive occurs before reacting the functional groups to bond with the wood

cellulose.

96. The process of claim 93 wherein the additive is selected from the group consisting of:

diatimatious earth,

sodium silicates,

boron or silicon salts,

boric acid,

trimethy (trialkyl) borate,

Boron Halides (BF3, BCl3, etc.),

Boric Anhydride (boron oxide),

phosphorous compounds,

copper compounds,

metal alkoxide,

meta-phosphoric acid;

a hydrophobic reagents,

phosphoric acid, and

metaphoshoric acid,

and combinations thereof.

97. The process of claim 72 wherein the solute compound comprises functional groups selected from the group consisting of R-Xa-Xb_3, R3-Xa-Xb, R2-Xa-Xb_2, R4-Xa, and XaR3 wherein R is an alkyl or a combination thereof, Xa is a trivalent, tetravalent or

pentavalent atom or a combination thereof and Xb is a halogen or alkoxy or hydroxyl group or combination thereof.

98. The process according to claim 72, wherein the wood cellulose has an original weight and wherein the duration of treatment attains a weight of compound which is covalently bonded to the wood cellulose in a range of 0.1 to 10 weight percent of the original weight of the wood cellulose.

99. The process according to claim 72, further comprising forming cyclic interlocking molecules having as a part of the cyclic structure at least two carbons within the cellulose and at least two of the atoms from the functional groups consisting of trivalent, tetravalent and pentavalent atoms.

100. The process of claim 81 further comprising the step of exposing the acids introduced into the wood to an acid neutralizing agent subsequent to the treatment.

101. The process of claim 81 further comprising the step of introducing an acid neutralizing agent into the wood prior to the exposure of the wood cellulose to the acid.

104. A process according to claim 72 wherein the wood cellulose is not dry and wherein the functional groups are solvated by the water in the wood prior to being covalently bonded to the hydroxyl groups of said wood cellulose.

105. The process according to claim 72 further comprising the step of adding water to the wood cellulose prior to applying the solution to the wood cellulose

106. A process for treating wood cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution comprised of a non-water-based hydrophilic organic solvent and a solute having a plurality of monomers comprising an atom selected from the

group consisting of tri-valent, tetravalent and pentavalent atoms, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring, applying said solution to the wood cellulose; and simultaneously diffusing said solution within said wood and reacting said solute to form covalent bonds, andforming a matrix structure comprising reacted monomers and wood cellulose.

107. The process of claim 106 further comprising the step of:

adding at least one non-reactive additive that enhances a desired property selected from the group consisting of:

fire resistance,

insect resistance,

moisture resistance

color,

adhesion, and

insulation, and

combinations thereof.

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108. The process of claim 107 wherein the step of adding the at least one non-reactive additive occurs before covalently bonding the compound to the wood cellulose.

109. Cancelled.

110. The process according to claim 106, further comprising a step of exposing the wood to ultra-sound sonification while applying said solution.

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111. A process for treating wood cellulose having a plurality of hydroxyl groups comprising the steps of:

Providing a solution comprised of a non-water-based hydrophilic organic solvent; a molecule which produces an acid in the presence of water in the wood cellulose diffused as a chemical from the solution and bonding with wood in conjunction with water in the wood and generating in the bonding a catalyst; and a molecule not producing an acid in the presence of water in wood cellulose diffused as a chemical from the solution and bonding with wood cellulose in the presence of the catalyst generated by the molecule producing an acid in the presence of water in wood cellulose.

112. The process of claim 111 wherein the catalyst is an acid produced by the molecule

which produces an acid in the presence of water in the wood cellulose is defined as a molecule

producing an acid causing a spontaneous reaction of the molecule producing an acid in the

presence of water in wood cellulose.

113. The process of claim 112 wherein the acid or a molecule which produces an acid in

the presence of wood cellulose is in the range of 0.1-10% of the solution.

114. The process of claim 112 wherein the acid or molecule which produces an acid in the presence of wood cellulose is in the range from 0.1 to 4.9% of the solution.

115. The process of claim 112 wherein the acid is selected from the group

consisting of acids from alkyl-silicon halides, acids from alkyl-halide monomers with trivalent,

tetravalent and pentavalent atoms, hydrochloric, meta-phosphoric acid, poly-phosphoric acid,

[bases from metal alkoxides] and Phosphoric acid and combinations thereof, wherein the

acid [or base] is in the range of 0.01-10% *in situ*.

116. The process of claim 112 wherein a molecule which produces an acid in the presence

of water in wood cellulose is a molecule comprised of silicone and a halogen.

117. The process of claim 112 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically and spontaneously with wood in the presence of a molecule which does produce an acid in the presence of water in the wood cellulose.

118. The process of claim 112 wherein the molecule which does not produce an acid in the presence of water in the wood cellulose would include hydroxyl and alkoxy bonded tetravalent atoms.

IN THE SPECIFICATION

1. On page 15, lines 2-6, here is the paragraph marked up:

Figures 13 a-c shows a block diagram of a process to treat wood.